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Implementation of ISO 50001 at Marine Corps Air Station Beaufort

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Acronyms

ASO	Air Station Order
BEQ	Bachelor Enlisted Quarters
CAPA	Corrective and Preventive Action
CMMS	Computerized Maintenance Management System
CO	Commanding Officer
DoD	Department of Defense
DoDEA	Department of Defense Education Activity
DOE	Department of Energy
DUERS	Defense Utility Energy Reporting System
ECE	Environmental Compliance Evaluation
ECIP	Energy Conservation Investment Program
EIP	Energy Investment Program
EMC	Energy Management Council
EMCS	Energy Management & Control System
EMS	Environmental Management System
EnMS	Energy Management System (defined by ISO 50001)
EnPI	Energy Performance Indicator (defined by ISO 50001)
EPIA	Energy Performance Improvement Actions
ESPC	Energy Savings Performance Contract
FAR	Federal Acquisition Regulation
FEMP	Federal Energy Management Program
FSRM	Facility Sustainment and Restoration Model
GME	Garrison and Mobile Equipment
HQMC	Headquarters Marine Corps
IEM	Installation Energy Manager
ISO	International Organization for Standardization
M2R2	Maintenance & Repair
MAG	Marine Air Group
MALS	Marine Aviation Logistics Squadron
MCAS	Marine Corps Air Station
MCCS	Marine Corps Community Services
MCICOM	Marine Corps Installations Command
MCIEast	Marine Corps Installations East
MILCON	Military Construction
M/R	Maintenance / Restoration
M&V	Measurement and Verification
NAVFAC EXWC	Naval Facilities Expeditionary Warfare Center
NFESC	Naval Facilities Engineering Service Center
NREAO	Natural Resources and Environmental Affairs Office
OC-ALC	Oklahoma City Air Logistics Complex

PAO	Public Affairs Officer
POC	Point of Contact
PW	Public Works
SECNAV	Secretary of the Navy
SEU	Significant Energy Use (defined by ISO 50001)
UCAB	Utilities Conservation Appraisal Board
UDR	Utility Demand Reduction
UEM	Unit Energy Manager
USMC	United States Marine Corps

Executive Summary

The U.S. Department of Defense (DoD) annually spends over $15 billion on energy, $4 billion of which is used for its facilities. The DoD has a mandate to reduce utility demand, in line with:

- Legislative requirements;
- Initiatives such as Navy's Energy Vision for the 21st Century;
- Greenhouse gas (GHG) reduction efforts;
- Reducing reliance on the vulnerable commercial electricity grid;
- Reducing reliance on foreign sources of fuel;
- Enhancing overall energy efficiency and reliability.

Located 70 miles southwest of Charleston in the heart of South Carolina, on 7,000 acres, the U.S. Marine Corps Air Station (MCAS) Beaufort (hereinafter "the Air Station" or "the installation" or "Beaufort"). Before 2012, the Air Station completed several federally funded energy and water efficiency and renewable energy projects. The Air Station had established an energy- and water-saving culture that explored and adopted new strategies and management approaches aimed at surpassing its utility reduction mandates.

In 2013, Beaufort committed to the implementation of a state-of-the-art energy management system (EnMS) based upon the internationally developed standard ISO 50001. ISO 50001 provides the business practice framework for organizations to establish a culture of continual energy performance improvement. Lawrence Berkeley National Laboratory (LBNL) and Georgia Institute of Technology (Georgia Tech) were contracted to facilitate the EnMS implementation, ensure conformance to the requirements of the ISO 50001 standard, and analyze the implementation to develop an implementation model that could be replicated across the Marine Corps.

Based on the "Plan-Do-Check-Act" continual improvement framework, the ISO 50001 EnMS standard codifies a methodology for establishing the processes and procedures that enable continual energy performance improvement in an organization. By December 2015, the Air Station had implemented all the requirements of the ISO 50001 standard. MCAS Beaufort found that the implementation of a systematic process for energy management provides significant performance improvements and a management framework for conducting data-based evaluation of energy efficiency and renewable energy projects.

The ISO 50001 implementation demonstration at MCAS Beaufort proved the feasibility of integrating an ISO 50001-conforming EnMS into existing command structures. The approach of leveraging external experts in gap analysis, EnMS training, and technical assistance were effective. In addition, strong leadership commitment and personnel resources were critical for success. Addressing typical personnel rotations by training newly rotated personnel and partnering key leadership positions in the EnMS structure with civilian counterparts can ensure program continuity. The project team brought forward many creative solutions that address the unique challenges for the Marine Corps and has paved the way for future Marine Corps EnMS implementations with example strategies and work products.

Implementation of an ISO 50001 EnMS at additional Marine Corps facilities could provide for integration of base energy-related data systems and standardized energy reporting, using meaningful metrics for energy performance improvement. Beyond the energy performance improvement benefits of ISO 50001, widespread adoption of the standard at Marine Corps facilities would provide the communication and integration basis on which to reduce energy resiliency concern and could integrate energy service cyber security protections base wide.

High levels of energy consumption, aggressive mandates from multiple sources, complex organizational structures, and constant personnel rotation make ISO 50001 a uniquely attractive proposition for the Marine Corps in support of the DoD's overall energy strategy. The recently launched Energy Ethos and Unit Energy Manager (UEM) programs offer dynamic action-based programs over which ISO 50001 based business management can provide integrated governance of the Marine Corps installations' energy programs.

1. Introduction

Marine Corps Air Station (MCAS) Beaufort

Marine Corps Air Station Beaufort, home of the Marine Corps' Atlantic Coast fixed-wing, fighter-attack aircraft assets, is located in the heart of the South Carolina Lowcountry and is among the United States military's most important and most historically colorful installations. Consisting of some 7,000 acres 70 miles southwest of Charleston, South Carolina, on Highway 21, the installation is home to six Marine Corps F/A-18 squadrons and one F-35B Fleet Replacement Squadron. (MCAS Beaufort, 2016)

Currently, the MCAS Beaufort family consists of more than 700 Marines and Sailors, along with 600 civilian personnel who ensure approximately 3,400 personnel of Marine Air Group (MAG) 31 and its component squadrons and tenant units are readily deployable. (MCAS Beaufort, 2016)

In fiscal year (FY) 2013, the current baseline for Marine Corps utility cost reduction, MCAS Beaufort spent a total of $3.67 million purchasing utility supplied electricity and natural gas. Approximately 90 percent of this cost was associated with the procurement of electricity (Figure 1). In FY 2015, the current baseline for facility energy intensity reduction, the Air Station consumed over 217,000 million Btu (MMBtu) of total energy on-site with the energy source mix shown in Figure 2. Purchased electricity was the single largest component, with 40,827 megawatt-hours (MWh) consumed. Other components included purchased natural gas and multiple on-site renewable energy generation sources added since 2003. These added renewable energy technologies include ground-source heat pumps (GSHP), solar hot water, and 520 kilowatts (kW) of solar photovoltaics (PV). Renewable energy sources total 6.5 percent of the on-site energy consumption. In addition, a 1,054 kW reciprocating cogeneration engine was also added to facilities electricity supply in 2011.

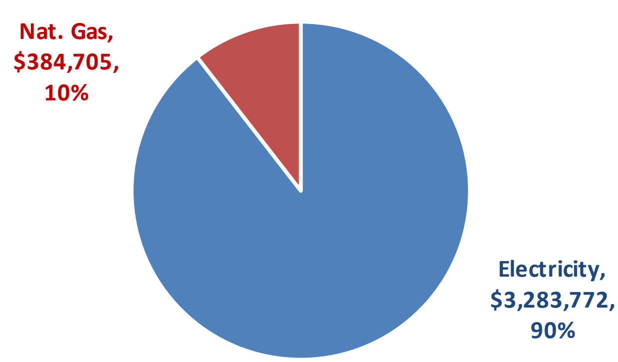

Figure 1. MCAS Beaufort Energy Cost Breakdown (FY 2013)

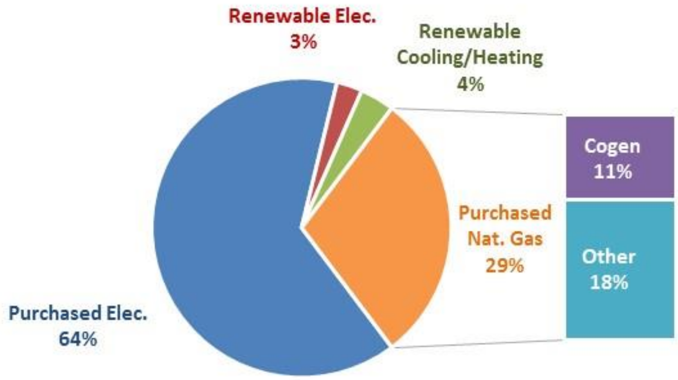

Figure 2. MCAS Beaufort Site Energy Source Mix (FY 2015)

It is the mission of the MCAS Beaufort Energy Team to reduce energy consumption across all activities when feasible and in accordance with Headquarters Marine Corps (HQMC), DoD, and Secretary of Navy (SECNAV) strategies, which include:

- Reduce utility costs by 10 percent with respect to a 2013 baseline by FY 2020;
- Reduce facility energy intensity by 25 percent with respect to a 2015 baseline by FY 2025;
- Renewable and alternative energy sources shall account for not less than 30 percent of total facility energy requirement by FY 2025.

Beaufort has been at the forefront of energy and water conservation among Navy and Marine Corps installations. In 2011, the Air Station was awarded for its significant achievement by the U.S. Department of Energy's (DOE) Federal Energy Management Program (FEMP). Most notable among Beaufort's energy savings achievements is the completion of a three-phase energy savings performance contract (ESPC) utilizing DOE's umbrella federal ESPC. A series of high-impact energy efficiency, renewable energy and cogeneration projects were installed under the ESPC. By June 2012, Beaufort successfully reduced its energy intensity by 30 percent compared to its 2003 baseline and its water intensity by 48 percent compared to its 2007 baseline; both overreached the mandated goals by timeline or scale (DOE, 2012).

The Air Station did not stop with its past achievements; it decided to pursue energy management in a more holistic fashion by implementing a state-of-the-art ISO 50001-conformant energy management system. The scope and boundaries of the EnMS includes the facilities located at the Air Station and the Laurel Bay Housing area, as well as Garrison Mobile Equipment (GME). Excluded from the EnMS scope and boundaries are the Department of Defense Education Activity (DoDEA) Schools, Family Housing, Townsend Bombing Range, and Flight Operations.

ISO 50001 – Energy Management Systems Standard

ISO 50001:2011 Energy Management Systems – Requirements with guidance for use was published by the International Organization for Standardization (ISO) in 2011. Based on the "Plan-Do-Check-Act" continual improvement framework (Figure 3), the standard codifies a methodology for establishing the systems and processes necessary to improve an organization's energy performance (ISO, 2011). At its core, robust energy planning is required, and that includes understanding mandates and requirements, analyzing energy sources and consumption, identifying top energy users, prioritizing improvement opportunities, developing an energy baseline, and selecting appropriate energy performance metrics for tracking and evaluating energy performance improvement. Since its publication, the ISO 50001 standard has seen exponential growth in adoption around the world, including its adoption by U.S. industrial and commercial organizations.

ISO 50001 introduces a disciplined approach to energy, previously missing in most organizations, which is analogous to the approaches that industry already applies to safety, product quality, and the environment. The ISO 50001 standard is flexible and can be implemented by any organization, from a single-facility to an entire enterprise. A core concept of ISO 50001 is an Energy Management System (EnMS).

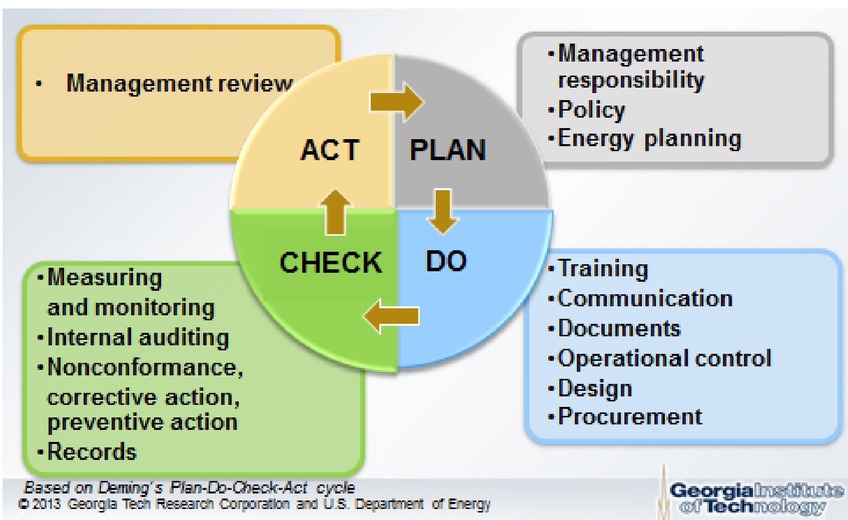

Figure 3. ISO 50001 "Plan-Do-Check-Act" Continual Improvement Cycle

An organization's EnMS establishes its energy policy and a set of energy objectives and targets. The EnMS then defines the processes needed to achieve these objectives and targets. These processes include determining significant energy uses (SEUs), developing action plans to improve energy performance, and sustaining these improvements with appropriate operational controls, competencies and awareness, and monitoring. It is a technology-agnostic approach that seeks to provide context for effective decision-making on energy performance improvements, while providing a platform for enhanced knowledge sharing on good energy management practices. The optional application of monitoring systems and devices may enhance the impact of ISO 50001 by supporting data-informed decisions.

ISO 50001 requires a lasting commitment from top-level management, thus making energy performance improvement a shared goal for the entire organization while moving beyond individual projects to a more holistic management approach. It also reduces dependence upon a single energy champion to drive continual energy performance improvement and sustains the energy management system despite personnel changes, by integrating energy management into daily operations and decision processes across the organization.

The ISO 50001 standard provides a framework that allows for plenty of flexibility when it comes to implementation by a specific organization. For example, the organization will develop an energy policy, energy objectives, and action plans which make sense to the organization's unique situations. This allows the Marine Corps to effectively manage energy performance without compromising DoD mission readiness as the first priority.

The ISO 50001 Implementation Project at MCAS Beaufort

In this project, MCAS Beaufort sought to establish a state-of-the-art energy management system that conforms to the ISO 50001 standard. Partnered with the Georgia Institute of Technology (Georgia Tech), Lawrence Berkeley National Laboratory (LBNL) was contracted to implement the project for Beaufort and study the resulting implementation for the Marine Corps at large. Both LBNL and Georgia Tech possess demonstrated expertise and industry-recognized thought leadership in energy management and ISO 50001. The implementation at Beaufort brings proven experience, tools, and training used in U.S. industry. MCAS Beaufort formed a cross-functional team to support the ISO 50001 implementation project. This team worked closely with the external experts, bringing to the effort multiple skills sets and perspectives, as well as the unique realities and challenges associated with operations at a Marine Corps installation.

The goals of this project were to:

- Implement an ISO 50001-conforming EnMS capable of passing a third-party certification audit;
- Install any required or necessary metering and monitoring equipment in support of the EnMS;
- Conduct an energy assessment of the identified SEUs for energy performance improvement opportunities;
- Through this report develop a case study implementation model that can serve as guidance for other Marine Corps and DoD installations expecting to implement ISO 50001.

At the onset of the project, the tasks required to achieve these goals at MCAS Beaufort were established, as Table 1 shows.

Table 1. MCAS Beaufort ISO 50001 Implementation Project Tasks

Task 1: Project Initiation
• Review goals and activities with the Command and discuss any concerns • Form a cross-functional Energy Management Team and designate a representative to report from the Team to Command • Develop project reporting and data collection processes in collaboration with site
Task 2: Implementation – PLAN
• Define the EnMS scope and boundaries and lay foundation for implementation • Develop an energy policy and determine relevant regulatory or other requirements • Conduct an Energy Review of energy uses and consumption; conduct an energy assessment to determine SEUs and identify opportunities for improvement • Establish a baseline; select metrics to track energy performance • Establish energy objectives and targets; develop action plans
Task 3: Implementation – DO
• Conduct gap analysis of existing energy management procedures against ISO 50001 • Initiate actions plans identified in Task 2 • Collect data as per approved plan; provide feedback as appropriate • Identify any system integration opportunities • Develop and implement a monitoring and measurement plan • Coordinate installation of measurement and monitoring equipment • Provide training to Beaufort personnel on ISO 50001 implementation elements • Create/update existing energy management procedures
Task 4: Implementation – CHECK & ACT
• Determine effectiveness of action plans • Relate results of findings to data analysis • Conduct internal audits and management reviews • Refine the EnMS based on the findings of above activities
Task 5: Full EnMS Assessment / Case Study
• Prepare the installation for an external ISO 50001 certification audit • Conduct data analysis and prepare presentation of results • Prepare case study summarizing project implementation and outcomes
Task 6: Project management, reporting, and documentation
• Prepare for on-site assessments and trainings • Assist development of a robust EnMS documentation framework emphasizing processes necessary to sustain continual energy performance improvement • Order supplemental measurement and monitoring equipment • Prepare quarterly progress briefings • Monitor progress and refine planned activities in response to specific requirements

2. Project Execution

Approach to Implementation

The EnMS implementation was carried out in phases organized around the Plan-Do-Check-Act continual improvement framework of ISO 50001:2011. The project began with a gap analysis and ended with a "path forward" webinar for the energy team and senior leadership. In between, there were three phases of EnMS development and implementation:

- Phase 1 – Energy planning ("Plan")
- Phase 2 – Implementation and operation ("Do")
- Phase 3 – Checking and management review ("Check" and "Act")

Subject matter experts from Georgia Tech guided and supported the Air Station's implementation team through these phases. ISO 50001 specifies "what must be done" in the EnMS, but it is up to the implementing organization to determine "how it will be done."

Each phase started with group training on the "what" of the ISO 50001 requirements relevant to that phase. The team exercises during the training addressed the "how." The results of a gap analysis, input from members of the team, and learning through the implementation process helped determine "how" the various EnMS processes would be implemented. A key construct of this approach was to "avoid reinventing the wheel" wherever possible. For example, the Air Station had already implemented an environmental management system (EMS), which is based on ISO 14001 and "owned" by the Natural Resources and Environmental Affairs Office (NREAO). Existing EMS processes were reviewed and, where appropriate and useful, were adapted for use by the EnMS.

Implementation Phases

Major components of each EnMS implementation phase are listed below.

<u>Phase 1 – Energy Planning ("Plan")</u>

- Conduct Phase 1 EnMS Implementation group training
- Establish the Air Station's energy policy
- Identify applicable energy-related legal and other requirements
- Initiate the energy review (energy assessment included)
    - Identify energy sources
    - Analyze energy uses and consumption
    - Determine significant energy uses
    - Identify opportunities for energy performance improvement
- Initiate development of Energy Performance Indicators (EnPIs)
- Determine energy performance metrics and baselines
- Establish energy objectives and energy targets

- Develop action plans to achieve the energy objectives and targets
- Conduct a management review of Phase 1 outputs

Phase 2 – EnMS Implementation and Operation ("Do")

- Conduct Phase 2 EnMS Implementation group training
- Perform a training needs analysis
- Implement competence and awareness training
- Identify and implement operational and maintenance controls for significant energy uses
- Implement design and procurement requirements
- Develop relevant documentation and implement document and records control
- Conduct management review of Phase 2 outputs

Phase 3 – Checking and Management Review ("Check" and "Act")

- Conduct Phase 3 EnMS Implementation group training
- Establish a measurement plan
- Develop the EnMS internal audit program
- Implement corrective and preventive action processes
- Validate EnPIs
- Complete a full internal audit cycle
- Complete a full management review cycle
- Conduct an external audit readiness assessment

Project Timeline

The time frame for any project or organizational initiative is most often a function of the level of allocated resources. Personnel time in EnMS development and implementation was the most critical resource required.

In setting a time frame for implementing ISO 50001 at MCAS Beaufort, existing organizational goals, priorities, and other elements were taken into account. A realistic time frame was sought because too short a time frame can result in a weak or incomplete system while too long a time frame can result in focus and enthusiasm waning.

A 24-month implementation time frame was deemed appropriate for the following reasons:

- Experience has shown that ISO management systems implementation in public sector organizations typically require a minimum of 18–24 months.
- MCAS Beaufort is a large organization with significant resource constraints and a critical mission to accomplish.
- For best results, an EnMS implementation at MCAS Beaufort needed to have the buy-in, cooperation, and participation of multiple facilities and

operational units. With regards to energy, new relationships needed to be developed over time.

- MCAS Beaufort has multiple decision-making and reporting structures (chains of command), which affect the length of time involved in obtaining necessary reviews and approvals that are part of the implementation and operation of the EnMS.
- Building a culture of energy awareness and positive energy behaviors takes time, particularly in hierarchy-based organizations.

The MCAS Beaufort EnMS implementation began in August 2013 and was achieved by September 2015, although the Georgia Tech team provided additional support through December 2015. Table 2 highlights the key dates associated with the ISO 50001 implementation at MCAS Beaufort.

Table 2. Key Dates of ISO 50001 Implementation Schedule

Date	ISO 50001 Implementation Element
August 2013	Kickoff meeting
October 2013	Phase 1 training – “Plan”
March 2014	Energy assessment conducted
July 2014	Phase 2 training – “Do”
January 2015	Phase 3 training – “Check and Act”
July 2015	On-site EnMS audit readiness check
September 2015	EnMS implementation complete
December 2015	Project conclusion

Energy Assessment

During Phase 1 of the ISO 50001 implementation, LBNL and MCAS Beaufort staff conducted an on-site energy assessment as a joint effort. This energy assessment meant to facilitate the ISO 50001 implementation rather than serve as a stand-alone service and is different than a traditional energy audit in its purpose, scope, and delivery of results.

As part of developing the energy review, a systematic scoring-based methodology was established to identify facility categories as the SEUs of the Air Station. The scoring methodology accounts for absolute energy consumption, energy intensity, facility function, and engagement of the MAG. Figure 4 shows the energy consumption and energy intensity of each facility category.

The MCAS Beaufort energy management team then identified three SEUs, which were defined as the scope of this energy assessment. They are:

1. Chilled and hot water plants and distribution systems serving the Bachelor Enlisted Quarters (BEQ) (hereinafter "the Barracks")
2. Pilot training buildings (#1049, #1078, and #2145)
3. Mobile van pad

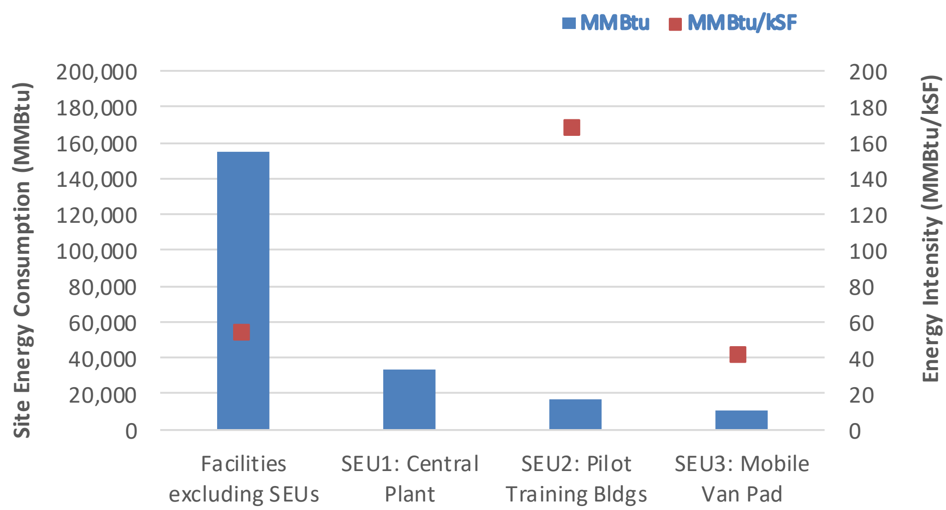

Figure 4. MCAS Beaufort Energy Consumption and Energy Intensity by Facility Category

The objectives of the energy assessment were to:

1. Provide guidance on establishing energy baselines for the three SEUs
2. Assist MCAS Beaufort in establishing energy performance indicators (EnPIs)
3. Identify potential energy performance improvement actions (EPIAs) for the SEUs
4. Develop lessons learned and a model of conducting energy assessments as an integral part of EnMS implementation at military installations for the DoD

The energy assessment focused on energy-using systems, such as the cogeneration plant, chillers, boilers, HVAC, and lighting systems that support work and life activities on base associated with the three SEUs. Lawrence Berkeley National Laboratory and MCAS Beaufort personnel collaborated before the on-site visit to confirm access to the site, relevant personnel, and data as needed. Security and mission readiness concerns surrounding the assessment were discussed.

The assessment lasted three days. Each day, the assessment team focused on one of the three SEUs. A typical day included a question and answer (Q&A) session with MCAS Beaufort facility personnel, Energy Management & Control System (EMCS) data review, walk-through to energy-using equipment, interviews with system operators and users, and documentation of operations observed. On the last day of the assessment, the LBNL team shared a list of recommended EPIAs as related to each SEU with the Beaufort staff (see Table 3). Many of the EPIAs had already been discussed with them throughout the three-day energy assessment process. The EPIAs were explained in detail in an energy assessment report prepared for Beaufort by LBNL and titled "Energy Assessment of Significant Energy Uses at Marine Corps Air Station Beaufort". Table 3 also shows the implementation status of the EPIAs at the time this report was written.

Table 3. Examples of EPIAs Recommended in LBNL's Energy Assessment

Chilled & Hot Water Plants and Distribution Systems	Pilot Training Buildings	Mobile Van Pad
*Create a "winter mode"	**Set back temperatures for ACs/CRACs when not in use	Insulate vans
*Optimize the chiller plant efficiency	Install occupancy sensors in infrequently used rooms	Thermally isolate interconnected vans
*Reconfigure the chiller plant flow	**Reduce or eliminate heating or cooling in unoccupied spaces	Install occupancy controls on wall-hung ACs
*Install a chilled water storage tank	*Evaluate potential cooling equipment retrofits	Securely fit and seal window-unit ACs
*Replace the compressor in Building #1338	Improve air management in the computer rooms	*Replace T-12 lamps with T-8 and electronic ballasts
**Implement enhancements to the Parker boiler	—	*Temporary and permanent shading

Note: AC = air conditioner; CRAC = computer room air conditioner
* EPIAs that are being or will be implemented by MCAS Beaufort (with or without scope changes)
** EPIAs that have been implemented by MCAS Beaufort (with or without scope changes)

Different from a traditional commercial/industrial energy assessment, no quantitative analysis of energy savings and financial payback were included in the scope, although general guidance on the range of expected energy savings is provided when available. The development of EPIAs focused on identifying no-cost or low-cost operational improvements rather than on capital-intensive actions. The MCAS Beaufort staff were very open-minded and willing to consider suggestions and ideas from the LBNL team. Following the energy assessment, MCAS Beaufort reviewed, prioritized, and determined that some of the recommended actions were to be integrated with Beaufort's EnMS action plans. It is noted that some of the recommended actions were not implemented or reduced in scope because the energy team has little control over the associated properties.

Highlighted Outcome from ISO 50001 Implementation

The ISO 50001 EnMS establishes formalized processes and procedures necessary for integrating energy management into an organization's existing management system and practices such that energy performance improvement can sustain. One of the most valuable processes established at MCAS Beaufort was the energy review process, which helped the Beaufort energy team to better align energy opportunities identification with their energy objectives and targets. It became clear to the Beaufort team that a renewable energy opportunity was an important area on which to focus.

One important part of the energy review process was the identification and annual energy performance analysis of the SEUs. The close collaboration between the Beaufort energy team and external experts provided many insights to analyzing the energy performance of the SEUs and their influential factors. Deep performance analysis of the SEUs led the Beaufort energy team to recognize the significant impact that solar shading had on the Mobile Van Pad—one of the Air Station's SEUs. This, combined with the renewable objectives established for the Air Station, led to the identification of a significant opportunity to improve the energy performance of the Mobile Van Pad and contribute to the attainment of the renewable objective.

The Mobile Van Pad facility has an array of air-conditioned 40-foot ISO containers. The containers provide office space and avionics facilities for the Marine Aviation Logistics Squadron (MALS) 31. This SEU accounts for approximately 10 percent of the Air Station's peak electrical demand. With the advanced metering system, it was noted that this facility had an approximate 30 percent reduction in peak electrical demand with cloud cover. The energy team developed a project that would make the Mobile Van Pad a Net-Zero operation, by providing a solar PV array large enough to cover the Mobile Van Pad area. The PV array will generate 3 MW of electricity while providing shading for the mobile van units. This project was approved in the FY 2016 Energy Conservation Investment Program (ECIP) and is currently in design.

As part of maintaining the energy management system, the energy review was updated, and corrosion control was identified as another SEU. This led to the development of a separate classification of facilities within the Air Station's domain for corrosion control and provided a more transparent view of Air Station energy performance to Marine Corps Command.

Additional improvement opportunities were identified and developed as an outcome of the focus on areas of significant energy use. One such example is the construction of a 400,000 gallon chilled water storage tank at the barracks chiller plant through the 2017 ECIP.

3. ISO 50001 Implementation Strategies at MCAS Beaufort

This section highlights some of the key strategies and experiences from implementing the various requirements of the ISO 50001 standard at the Air Station. The details provided here can be useful to personnel who may or have been tasked with ISO 50001 implementation. For the convenience of the reader, brief summaries of the relevant ISO 50001 requirements are provided; however, these summaries are not comprehensive, and they are not intended as a substitute for purchasing and reviewing the requirements of the ISO 50001:2011 standard.

Scope and Boundaries

ISO 50001:2011, §4.1: These requirements involve defining the extent of the activities and facilities and organizational or site limits to be included in the EnMS.

Defining the scope and boundaries of the EnMS at MCAS Beaufort focused on those facilities for which energy performance is reported to Marine Corps Installations East (MCIEast), and over which the Air Station Command has control. In general, this included those facilities with reportable energy consumption identified through the Defense Utility Energy Reporting System (DUERS) database and spreadsheet. The scope and boundaries of the Air Station's EnMS were defined for the community of "Fightertown" as including a large set of diverse facilities spread across two campuses—the main Air Station and the Laurel Bay housing complex—along with the Air Station Garrison and Mobile Equipment (GME) fleet of gasoline-, diesel-, and electric-powered vehicles. Excluded from the scope and boundaries were the DoDEA Schools, Family Housing, Townsend Bombing Range, and Flight Operations.

One important aspect of this activity was to review all existing command structures within the defined scope and boundaries. The presence of three separate command structures at MCAS Beaufort created barriers to energy awareness, communication, and adoption of the policies and procedures needed to support the EnMS implementation. There exists an Air Station Commanding Officer (CO), a MAG CO, and a MALS CO. Having access to personnel who could affect the EnMS and energy performance in all of these separate command structures was a challenge throughout this project. Being able to understand the command structures is crucial to effectively implement the EnMS requirements related to top management responsibility, internal communication, and the responsibilities of other EnMS roles.

Management Responsibility

ISO 50001:2011, § 4.2: Top management must demonstrate its commitment to the EnMS and to continual improvement through specific actions specified in the standard.

For the purposes of the EnMS, the Air Station's CO and Logistics Officer were designated "top management" (aka, "senior leadership"). The Energy Manager / Utilities Director was appointed as the EnMS management representative, and the members of the Air Station's Energy Management Council (EMC) comprised the members of the energy team. The EnMS management review process (see the "Act – Management Review" section) was the primary forum through which senior leadership executed and met its responsibilities as set out in ISO 50001.

Energy Policy

ISO 50001:2011, § 4.3: The energy policy is senior leadership's statement of its intentions with respect to energy management and energy performance. Specific commitments are required, including a commitment to achieving continual improvement in energy performance.

MCAS Beaufort had a preexisting energy policy before ISO 50001 implementation. The existing energy policy was evaluated during Phase I Implementation Training as a team exercise, and it was determined that it did not fully meet all ISO 50001 requirements. The Public Works Officer and the Management Representative took the lead on revising the policy. The revised policy also contains the ISO 50001 required energy objectives and targets (MCAS Beaufort, 2014). The revised energy policy statement is communicated across all levels of the Air Station.

ISO 50001 does not require that specific energy objectives and targets be included in the energy policy statement (i.e., they can be stand-alone items), but it was found to be an excellent vehicle for broadly communicating those objectives and targets. However, it also means that the policy will need revision each time a new or revised energy objective or target is established by the Air Station or by federal, DoD, or other mandate. The need for revisions to the energy policy can far outpace the typical timeline involved in gaining the Commanding Officer's approval. Effective measures are necessary to avoid potential nonconformity caused by outdated energy policy in an audit situation. In addition, the policy statement can fall out of conformance when revised inappropriately through the chain. Therefore, it is important to (1) communicate along the chain of approval the required commitments that must be included in the policy statement, and (2) allow the Management Representative to review the final version against ISO 50001 requirements after it has been through the chain and is ready for the CO's approval.

Energy Planning – Legal and Other Requirements

ISO 50001: 2011, § 4.4.2: Energy planning includes identifying the applicable legal and other requirements related to the organization's energy use, consumption, and efficiency. ISO 50001: 2011, § 4.6.2: "Checking" the system requires that evaluations of compliance with the applicable energy-related legal and other requirements be conducted.

As a federal and DoD installation, the Air Station has many mandatory requirements related to energy consumption and energy management. The implementation focused on formalizing existing processes for keeping up to date on legal and other mandatory requirements. This effort was supported by the NREAO personnel who manage similar processes for the Air Station's environmental management system. Their experience and expertise was leveraged in developing the *Legal and Other Requirements Tracking Matrix* for energy management and energy performance-related requirement information. A compilation of existing mandates proved a useful starting point for this matrix.

Although similar processes for environmental management were leveraged, adopting the compliance auditing processes of the EMS was not a practical option. For energy, it lacks infrastructure for compliance auditing, and hence, it may have to rely on the mandatory energy reporting (e.g., DUERS reporting) and data call requirements managed by the Air Station's Energy Office as evidence that the applicable energy-related legal and other requirements (including the energy objectives and targets) are being met. Some of the audits and inspections related to energy security and related issues that are conducted periodically by HQMC, MCIEAST, or others may be appropriate for inclusion in the EnMS to support compliance evaluation.

Energy Planning – Energy Review

ISO 50001:2011, §4.4.3: The energy review identifies the organization's energy sources and energy uses and analyzes past and present energy consumption. This information is used to determine significant energy uses (SEUs) and opportunities for energy performance improvement.

Prior to EnMS implementation, Public Works at MCAS Beaufort had been aggressively developing an integrated energy data management system and employed a state-of-the-art system for measuring and tracking energy performance of the Air Station facilities and monitoring system operation. The availability of current and historical energy data for the Air Station and facilities made the energy review process much easier to implement. In addition, the existing DUERS data spreadsheet was determined to be a good resource to analyze energy consumption and to use as required by ISO 50001. The implemented energy review process is documented in the Air Station's Energy Program Manual.

It is worth noting that the energy review process at Beaufort was somewhat atypical in that the SEUs had to be defined in the very beginning due to the need to install additional metering within the project time frame. This is not a requirement of ISO 50001. Usually, SEUs are identified after foundational elements (e.g., management responsibility, energy policy) of the EnMS are established, and as an outcome of the energy review's data analysis process. It created some confusion in the beginning. However, the new metering was intended to provide additional system data for analysis and optimization of the Air Station's SEUs.

In the past, opportunities for energy performance improvement were focused primarily on capital improvement projects. The Air Station Utility Manager had a system for prioritizing such projects, which allowed them to take advantage of special funds as they became available. The project opportunities are tracked using the M/R Projects database, a custom application developed at MCAS Beaufort for managing Facility Sustainment and Restoration Model (FSRM) projects. There was no existing process for tracking opportunities that were not capital in nature, e.g., behavior change campaigns. The M/R Projects database was modified to allow it to track and prioritize all energy opportunities.

Energy Planning – Energy Baseline and Energy Performance Indicators (EnPIs)

ISO 50001:2011, §4.4.4 and §4.4.5: – EnPIs and their associated baselines are the metrics developed by the organization to measure its energy performance.

Measures of energy performance were in place at the Air Station prior to the EnMS. There are a host of executive branch or DoD related mandates for energy consumption reduction for facilities and vehicles. The Air Station's primary metric for analyzing and reporting energy performance is (millions Btu)/(thousand square feet) or MBtu/ksf. The objectives for reducing the metric of MBtu/ksf incorporate the relevant baselines. At the time of the implementation, the baseline was 2003. At the time of this report this mandate has been updated with a new baseline of 2015.

Other performance metrics were investigated, including normalized modeling by relating weather and base activity level to energy consumption. Natural gas consumption could be modeled quite effectively. Modelling electricity proved to be a challenge due to the lack of complete metered data for photovoltaic arrays installed at the Air Station, as well as the changes to the cogeneration system just before the EnMS project. More work is needed to fully meter the energy sources to provide the data needed to complete the model development. Determining an appropriate measure of monthly Air Station activity level, which affect the energy use, would be key to having a meaningful normalized energy model.

Energy Planning – Energy Objectives and Energy Targets

ISO 50001:2011, § 4.4.6: The organization must set objectives and targets for energy performance improvement. Specific considerations are required.

The Air Station's energy objectives and energy targets, and the associated time frames for their achievement, are established by mandates embedded in Executive Orders, DoD Instructions, and the like. The Energy Manager reviews these mandates and develops the statement of energy objectives and targets for the Air Station with input, review, and approval by the EMC and the CO. As previously mentioned, the energy objectives and targets are documented and communicated through the Air Station's Commanding Officer's energy policy statement. The current objectives and targets are found in the "Executive and Marine Corps Orders" section of this report.

In setting and reviewing its energy objectives and targets, the Air Station considers its financial, operational, and business conditions, technology options, and the views in interested parties as part of the Energy Investment Program (EIP) and Energy Conservation Investment Program (ECIP). These programs identify and evaluate potential energy projects that will help the Air Station achieve the energy performance improvements set out in the energy objectives and targets.

Energy Planning – Action Plans

ISO 50001:2011, § 4.4.6: Action plans for achieving the energy objectives and targets are required.

The Air Station has many energy management related projects ongoing at any time from different sources. Early in the process, it became clear to the team that it would not be feasible to try to build ISO 50001 compliant action plans upon existing, ongoing projects. This was true for three reasons: (1) within the Energy Office's M/R database there was a lack of traceability between the Air Station's energy objectives and targets and recent/ongoing energy projects, (2) there was a lack of consistency in the information available within the database project records—particularly pertaining to project energy performance improvement verification, and (3) not all the relevant projects are under the direct control of the Air Station. The above gaps in the M/R database will need to be addressed for future projects so that the energy benefits of all efforts at the Air Station can be captured under the new EnMS. Another obvious gap in measurement and verification (M&V) was identified for local projects which currently do not have verification processes similar to those ESPC projects at the Naval Facilities Expeditionary Warfare Center (NAVFAC EXWC), which is previously known as the Naval Facilities Engineering Service Center (NFESC).

Therefore, the Air Station learned to step out of the traditional "energy project" approach and build action plans at a strategic level. Each of the five energy action plans implemented below are tied to achieving one or more of the current energy objectives and targets.

- Establish a state-of-the-art energy management system that conforms to ISO 50001:2011
- Establish Unit Energy Managers and the Energy Ethos program
- Identify and evaluate opportunities for adding PV arrays to existing facilities and new construction projects
- Plan and submit energy improvement projects as operations and budgets permit
- Implement an Air Station Wide Energy Awareness Program

This structure produced a realistic solution for sustaining the action plan requirements of ISO 50001 and provided a meaningful process for communicating with top management about the effectiveness of the EnMS in achieving the energy objectives and targets. This effort began early in Phase 2 of the implementation and was completed at the end of Phase 3.

Implementation and Operation – Competence and Training

ISO 50001:2011, §4.5.2: Personnel performing work related to the organization's significant energy uses (SEUs) must be competent based on appropriate education, training, skills, or experience. Training needs related to control of the SEUs and the operation of the EnMS must be identified and addressed.

Existing practices for hiring, training, and identifying the competencies of SEU service personnel provided a good foundation for expanding upon and meeting EnMS competency requirements. A series of interviews with operators and maintenance personnel whose work was related to the SEUs (i.e., the pilot training facilities, mobile van pads, and hot and chilled water generation for barracks) were used to collect information on relevant qualifications and training. There are many energy systems and key personnel, including active duty military and civilian employees and contractors, manufacturer's technicians, and others who can affect the energy performance of SEUs. The rotation of active duty personnel can present challenges for sustaining the EnMS requirements related to the competency and training of personnel whose work is related to the SEUs.

The relevant competencies and/or training required for each SEU are recorded on the SEU Personnel and Operational Control Worksheet form. Individual records of competence and training are retained by employers and would be auditable.

Due to limited access to the Original Equipment Manufacturer (OEM) and special service personnel performing infrequent or specialized repairs on the SEUs, their competency and training requirements were not fully captured by this EnMS implementation. However, they should be captured as circumstances make it feasible and convenient to do so.

Implementation and Operation – Training and Awareness

ISO 50001: 2011, § 4.5.2: Personnel must be aware of the energy policy and the requirements of the EnMS, including their roles and responsibilities, the benefits of improved energy performance, the impacts of their energy behaviors and how they contribute to the energy objectives and targets.

A formal approach to identifying training needs related to operation of the EnMS was implemented using multiple tools from the DOE eGuide.[1] It focused on capturing awareness training needs across the Air Station (e.g., "General EnMS Awareness Training), as well as the training needs of EnMS internal auditors. In some cases, the training needs were identified on a Training Needs Matrix, while others were set out within specific procedures (e.g., an EnMS Internal Audit Procedure).

[1] The DOE eGuide has been rebranded and updated as the DOE Guide to Energy Management (GEM).

In early implementation, the team held brainstorming sessions to identify existing mechanisms that could be leveraged for broad energy awareness. During the Phase 2 Implementation Training, contents were developed on the specific energy awareness topics required by ISO 50001, and various energy-related communications and supporting materials were planned.

Later, when the USMC Energy Ethos Campaign and Unit Energy Manager (UEM) program were announced, they were identified as excellent candidates to fit within the EnMS structure. This is because these programs offer great potential for reaching across the Air Station and the tenant commands to generate the broad energy awareness required by ISO 50001. In turn, ISO 50001 provides the *management system* processes needed to fully deploy Energy Ethos and the UEM Program and support the intended culture change. Fully integrating these programs into the training, awareness, and communication processes of the ISO 50001 EnMS would ensure that Energy Ethos and the UEM Program sustain over the long term as an integral part of how energy is managed in daily operations across the installation. Full integration with neither program was possible within the EnMS implementation time frame at Beaufort, although a *General EnMS Awareness* PowerPoint presentation was developed for access through the Air Station's Energy Ethos webpage.

The ongoing rotation and deployment of personnel at military installations presents a unique challenge; it is important to recognize that energy awareness in this setting is a journey, not a destination. It must not only be part of new employee orientation and "welcome" briefings for military personnel, but must be embedded in expectations for individual behavior. This is another reason why marrying the Energy Ethos and the UEM Program with ISO 50001 EnMS holds so much potential for the overall implementation success (see Appendix B: ISO 50001 Provides the Processes Needed to Deploy "Energy Ethos" and Support Utility Demand Reduction). Another challenge was making sure troops understand ISO 50001 is a priority next to their ordered mission.

Implementation and Operation – Communication

ISO 50001: 2011, § 4.5.3: The organization must communicate internally about its energy performance and the EnMS, and provide a process for making comments or suggesting improvements. If the organization decides to communicate externally about its energy policy and energy performance, a method for this external communication is established.

Energy communications compete for attention with many other important priorities at the Air Station. A comprehensive communication strategy that takes into account Energy Ethos and the UEM program is recommended. The Public Affairs Office (PAO) is the "owner" of key Air Station-wide communication processes with considerable experience in messaging for various audiences. Therefore, PAO should be represented on the EnMS implementation team and fully engaged in the implementation of EnMS energy awareness and communication requirements.

The implementation of the EnMS communication requirements focused on leveraging and expanding upon existing mechanisms. These include "all-hands" e-mails, the Energy Ethos webpage, communication board postings, *Jet Stream* articles and news releases by PAO, presentations at the periodic Civilian Breakfasts, Marine Corps Community Services (MCCS) Customer Service Classes, and Public Works weekly "Situation Reports," among others. Internal communications about the EnMS, including the CO's energy policy, were planned as part of the energy awareness implementation. Internal communication about energy performance was well established between the Air Station's Energy Office and senior leadership, including internal dissemination of monthly updates to the DUERS spreadsheet and the quarterly EMC meetings.

Leveraging the existing Interactive Customer Evaluation (ICE) process seemed to be a practical option for implementing an Air Station-wide energy comment and suggestion system. The results were mixed, however. It was a challenge to use ICE as a suggestion system for energy when it has historically served as the Air Station's complaint system. The personal relationships of the Energy Manager continued to play an important role in the comment and suggestion process.

The Air Station communicates externally about its energy policy, EnMS, and energy performance, as required by the chain of command. This includes, for example, various monthly, quarterly, and annual energy reporting mandates and a large number of data calls. The various methods used for external communications and the responsible personnel were defined by the implementation team using an Interested Parties Worksheet.

Implementation and Operation – Documentation

ISO 50001: 2011, § 4.5.4: Information on the core elements of the EnMS and some specified EnMS documents must be developed and implemented. EnMS documents must be controlled.
ISO 50001: 2011, § 4.6.5: Records needed to demonstrate conformity to the EnMS and ISO 50001 must be established and maintained, including records of energy performance results. EnMS records must be controlled.

The difference between EnMS documents and records and their purposes were addressed in the Phase 1 and Phase 2 EnMS Implementation Training sessions, which was important to proper implementation of the documentation requirements.

Although it is not required by ISO 50001, an Energy Program Manual was developed to describe the core elements of the EnMS and provide a "roadmap" to relevant EnMS information and documentation. To ensure that the EnMS is executed across its defined scope and boundaries, it is planned that the Energy Program Manual will be reviewed and approved as an Air Station Order (ASO). The manual was developed iteratively as the various EnMS processes were defined through three phases of the ISO 50001 implementation.

Many of the records needed for the EnMS were already in place at the Air Station. These included, for example, energy consumption data, minutes of the quarterly meetings of the Utilities Conservation Appraisal Board (UCAB) (which later became the EMC), and energy performance improvement opportunities within the Air Station's M/R database.

The implementation team relied on the Public Works Program Support Assistant to ensure that EnMS processes for controlling documents and records were aligned with the relevant Air Station requirements for documentation. A Document Control Index and a Records Control Index were developed from DOE eGuide templates. These index tools provide a convenient "one stop shop" for identifying EnMS documents and records. In defining retention periods for various EnMS records, relevant federal, DoD, USMC, and other related record retention requirements were considered.

Implementation and Operation – Operational Control

ISO 50001: 2011, § 4.5.5: Operational and maintenance controls are used to bring the SEUs and energy uses related to the energy objectives, targets and action plans into efficient and sustainable operation. Operational criteria are established and, along with relevant controls, are communicated to appropriate personnel.

ISO 50001 requires that operational and maintenance controls be established for the SEUs. The relevant existing operational and maintenance controls at the Air Station were identified and incorporated into the EnMS using a control chart tool, which was customized from the DOE eGuide for ISO 50001 implementation.

The impact of the SEUs on the Air Station's energy performance is primarily the result of conditioning the indoor environment in the subject facilities. Operational control of the indoor environment is managed through an integrated energy management control system with an established collection of set points and alarms. The operating set points are mandated by MCIEast directives. Maintenance controls of the SEUs are managed through the contract provider or, for mobile van pad, the active duty personnel. All maintenance activities for the Pilot Training facilities and the BEQ hot and chilled water systems were managed and recorded through the Air Station computerized maintenance management system (CMMS) – IBM MAXIMO. The mobile van pads maintenance was managed and recorded by the assigned MALS command.

Energy performance of the SEUs is monitored separately from the monthly analysis of facility energy intensity in the DUERS data spreadsheet, which is include the Air Station's remaining facilities. Significant deviations for SEU energy performance are defined in the EnMS Measurement Plan. The Air Station is encouraged to establish an effective communication process with the SEU facility occupants to help them understand their role and impact on energy performance.

Implementation and Operation – Design

ISO 50001: 2011, § 4.5.6: Energy performance improvement opportunities and operational controls must be considered in the design of new, modified and renovated facilities, equipment, systems, and processes that can significantly impact energy performance.

Implementation of the design requirements focused on identifying the touchpoints between energy performance considerations and the various types of projects at the Air Station that involve design of new, modified, or renovated facilities, equipment, systems, and processes. Public Works Engineering personnel participated in this effort. The types of projects that included energy considerations in design were determined to be Military Construction (MILCON) Design-Build, MILCON Design-Bid-Build, and Maintenance & Repair (M2R2). It was also found that consideration of operational controls in design activities were found to be embedded primarily in the preventive maintenance specifications associated with the projects.

Two significant challenges were identified during implementation. First, the Air Station's Engineering and Energy Offices do not control the processes involved in the development and design of those projects. Instead, they are dictated by federal and DoD requirements with the involvement of many other parties who are outside the EnMS defined scope and boundaries. This means that the Air Station can only be held accountable for including energy considerations in project designs at those points where they have the opportunity and responsibility to provide such input. Second, it was found challenging to access the records which would provide objective evidence that energy considerations were included in project designs. The lack of standardized metadata in the Facilities Document Library made it difficult to identify and access the needed project records. This issue will need to be addressed if the Air Station decides to pursue ISO 50001 certification.

Implementation and Operation – Procurement

ISO 50001:2011, § 4.5.7: Suppliers must be informed that energy performance is an evaluation factor in procurement actions related to the SEUs. Criteria for assessing lifetime use, consumption, and efficiency must be defined and implemented for procured items expected to significantly impact energy performance. Documented specifications for the purchase of energy sources are required.

The Air Station's procurement processes are dictated by federal, DoD, and local requirements which include energy efficiency considerations. The implementation focused on identifying the elements of existing procurement and related processes that met the ISO 50001 requirements. These elements included, for example, the Air Station's *Green Procurement Environmental Standard Operational Procedure*, ENERGY STAR requirements, and relevant Federal Acquisition Regulation (FAR) clauses for larger purchases. Procurement personnel at the Air Station contributed to this effort. Lifecycle analyses were determined to be part of several processes, including EIP, ECIP, and M2R2 projects (when applicable).

Given the specialized procurement procedures at the Air Station, communication was found to be critical to ensure that relevant procurement personnel are kept informed of the energy users that can significantly impact the Air Station's energy performance. Similarly, personnel who have purchasing authority in the SEUs need to be aware of how the ISO 50001 procurement requirements apply to the SEUs. In addition, coordination is required between EnMS recordkeeping and purchasing authority related to the Air Station's SEUs, in order to demonstrate conformance to ISO 50001 procurement requirements.

Documented specifications for the purchase of energy supply are contained in contracts with utility providers, local Public Service Commission Rules and Regulations, Naval Facilities Engineering Command (NAVFAC) Requests for Electrical or Natural Gas Services, and the Air Station's Air Quality Title V Operating Permit.

Checking – Monitoring, Measurement, and Analysis

ISO 50001:2011, § 4.6.1: The key characteristics of operations that determine the organization's energy performance must be monitored, measured, and analyzed. An energy measurement plan is defined and implemented, significant deviations in energy performance investigated, and processes implemented for ensuring accuracy and repeatability in monitoring and measurement equipment.

The legacy of energy reporting and data collection present at the Air Station provided a substantial foundation for the implementation of the monitoring, measurement, and analysis processes of the EnMS. The complicating factor is the breadth of the defined scope and boundaries of the EnMS. Energy reporting for the Air Station is accomplished through the DUERS data spreadsheet, which was modified to accommodate the relevant EnMS requirements. Many of the EnMS key characteristics are monitored and analyzed on this spreadsheet.

Thirty-nine (39) electricity and natural gas meters were identified during the process of complying with the requirements to monitor, measure, and analyze the EnMS key characteristics. In addition, fossil fuels for vehicles and backup generators are measured by storage meters located at the Station Fuels tank farm. Significant energy use energy performance, renewable energy, and other performance metrics were also identified as relevant key characteristics associated with the EnMS. Due to the large number of meters and associated key characteristics, it was decided to develop a comprehensive measurement plan for the EnMS. The spreadsheet form developed for tracking these requirements is labeled the "MV Plan" and is managed as a controlled EnMS document.

Checking – Internal Audit of the EnMS

ISO 50001: 2011, § 4.6.3: EnMS internal audits conducted at planned intervals are required to ensure that the EnMS is effectively implemented and maintained and energy performance is improved.

A few good practices were identified in forming the internal audit team. First of all, the ongoing personnel rotation at the Air Station requires that a larger pool of qualified internal auditors be available. Second, a cross-functional team was found desirable to ensure the independence of auditors from the processes being audited, which in turn supports the impartiality of the internal audit process. The Air Station's initial pool of seven auditors came from Office of Public Works, Energy Office, Engineering, Finance (Controller Office), and NREAO. Third, cross-training between personnel with management system auditing experience (from NREAO) and those with energy expertise (from the Energy Office) allowed for effective teaming arrangements.

The EnMS internal auditors were trained during the face-to-face Phase 3 EnMS Implementation Training by conducting "practice audits" with observation and feedback from the instructors. After the Phase 3 training, it was determined that monthly internal audits will continue for several months so that: (1) the newly trained internal auditors continued to build their auditing skills, (2) a "check" was provided on the implementation status of various EnMS processes, and (3) it provided a real-world basis for the development of the EnMS internal audit program and associated procedures and forms. The results of the internal audits in Phase 3 were used to prioritize the remaining ISO 50001 implementation tasks and ensured the completion of a full EnMS internal audit by the end of implementation.

Administrative support is needed to help manage the EnMS internal audit program. This support helps to ensure that audits are properly planned and conducted in accordance with the audit schedule, and that audit assignments are communicated and required records maintained. In this project, the Public Works Administrative Support Assistant assumed responsibility as the EnMS Internal Audit Program Manager, a position that works closely with the EnMS Management Representative to implement and maintain an efficient and effective internal audit program. Such responsibilities should be formalized within the administrative position's job description to ensure continuity of support to the EnMS during mandatory personnel rotations.

ISO 50001 management system auditing is a documented process with an EnMS internal audit procedure developed. A variety of EnMS internal auditing tools from the DOE eGuide were adopted for use in the Air Station's EnMS internal auditing program.

Checking – Nonconformities, Correction, Corrective and Preventive Action

ISO 50001:2011, §4.6.3: Processes must be in place to identify actual and potential problems, make corrections, and take appropriate corrective or preventive action.

The Air Station already had defined processes for handling nonconformities related to contracted services. It was found that existing systems for preventive and work order maintenance already addressed identification and correction of actual and potential operational and maintenance issues. Problem solving and correction are also integral parts of the Energy Office's daily activities. Although a formal corrective and preventive action (CAPA) system is part of the EMS, it is operated and maintained by NREAO and focuses primarily on regulatory environmental issues. It was reviewed by the implementation team for potential input to the development of a CAPA procedure for the EnMS. Ultimately, a simpler procedure in a user-friendly format was developed using several implementation resources from the DOE eGuide for ISO 50001 implementation.

The implementation initially focused on addressing EnMS internal audit findings, although the overall CAPA system for the Air Station's EnMS has been designed to accommodate issues from multiple sources. For example, other potential sources of corrective and preventive action could be management review (i.e., quarterly EMC meetings), energy assessments, monitoring and measurement activities, external audits, employee suggestions, and data trend analyses. It is expected that issues and opportunities reported from those other sources will likely increase as the EnMS matures over time.

Similar to the need for administrative support identified for internal audits, implementation and management of the CAPA processes also required administrative support (from the Public Works Program Support Assistant). These responsibilities should be formalized within the administrative position's job description to ensure continuity during mandatory personnel rotations.

In the process of addressing a corrective or preventive action request (CAR/PAR), it is desirable to have the EnMS internal auditor follow up on the requests that they reported so that the auditor can be engaged in continual improvement and share follow-up responsibilities with the Management Representative or Energy Manager.

Act – Management Review

ISO 50001:2011, §4.7: Senior leadership must review and take action to ensure continual improvement in energy performance and the continuing suitability, adequacy, and effectiveness of the EnMS. Specific inputs and outputs are required.

In the MCAS Beaufort implementation of ISO 50001, the management review process was established relatively quickly by leveraging the existing Energy Management Council (EMC) quarterly meetings. Adding the inputs to the management review required by ISO 50001 was an iterative process through all three phases of ISO 50001 implementation. Once the outputs from each phase of implementation were generated, those that were required inputs to EnMS management review were added to the agenda for the next EMC meeting. So, by the end of the ISO 50001 implementation process, all the management review inputs and outputs required by ISO 50001 had been incorporated into the EMC meeting agendas. A comprehensive Management Review Record form was developed to track the EnMS required inputs and outputs of the management review.

Leveraging the EMC and its quarterly meetings for purposes of EnMS implementation helped transition the briefing format of EMC meetings to an active review and decision-making format. This was the result of leveraging the EMC as the primary mechanism through which senior leadership demonstrated the responsibilities of top management as required by ISO 50001.

The EMC meeting is attended by the following positions: Station CO, Station S-4, PWO, DPWO, MCCS Maint, NREAO Officer, PWE, MAG-31 Logistics Officer, NREAO EMS Manager, and the Energy Manager / Utility Director. The Station CO or Station S-4 is required at each meeting to represent EnMS top management.

4. For Marine Corps Leadership – Future Adoption of ISO 50001 among the Marine Corps

Advantages for Widespread Marine Corps Adoption of ISO 50001

ISO 50001 can serve as a Marine Corps-wide framework for meeting new energy-related mandates and achieving deeper energy savings. The ISO 50001 management framework promotes a systematic and sustainable approach to managing energy and achieving energy performance improvement. Under this framework, the processes of the energy management system (EnMS) will be standardized for tracking mandates, updating objectives and targets, measuring and reviewing energy uses, generating and executing action plans, documenting and reporting, controlling, and continuously improving.

High energy intensity, multi-source mandates, complex organizational structure, and constant personnel rotation make ISO 50001 a unique proposition for the Marine Corps in support of DoD's overall energy-security strategy. ISO 50001 can provide overarching governance for the Marine Corps installations' energy programs, resulting in continuity and greater results from programs such as Energy Ethos and Unit Energy Manager. The demonstration of ISO 50001 implementation at MCAS Beaufort proved the feasibility of integrating an ISO 50001-conforming EnMS into existing command structures. Working with external experts, the Beaufort energy team brought forward many creative solutions that address the unique challenges facing the Marine Corps. The Beaufort demonstration has paved the way for future Marine Corps ISO 50001 implementations, with example strategies and work products. Adopting ISO 50001 Marine Corps-wide will undoubtedly increase the consistency, streamlining, and impact in energy management across installations.

Leadership Structure and Resources

Introducing change to any organization requires strong leadership commitment and personnel resources. This will be true for a successful Marine Corps-wide ISO 50001 implementation. Table 4 provides a general guideline of leadership structure and associated level of time requirements that can be expected to achieve such a result. As demonstrated in many industrial companies that have implemented ISO 50001 enterprise-wide, the resources required to maintain the EnMS is expected to reduce significantly after the initial implementation is complete.

It is important to note that the typical personnel rotation schedule within the Marine Corps presents a unique challenge for both implementing EnMS and maintaining top management commitment. In addition to training and engaging newly rotated personnel, military personnel that are assigned leadership positions in the EnMS structure should be considered to be partnered with a civilian counterpart to ensure program continuity.

Table 4. Leadership Structure and Resources Required for ISO 50001 Implementation

Roles	Appropriate Candidates	Time Requirements
Steering Committee	Should include top management of all hierarchical structures within the EnMS scope and boundaries in order to direct and secure resources for the implementation. e.g., the Air Station's senior leadership. (See the "Act – Management Review" section above for the Beaufort example.)	5% of their time during implementation.
Management Representative	On the steering committee, at the level of top management within the base; have authority needed to drive changes and enforce schedules across all operations of the base. Should be partnered with a civilian who is not expected to transition away during the implementation.	10% of their time during implementation.
Energy Management Team Members	A multi-functional team including representatives from Public Works, Engineering, Safety, Finance, Environmental, MCCS, the MAGs, and other relevant functions and units.	10%–20% of their time during active participation (could be only for a limited duration). 3/4 to 1 full-time-equivalent (FTE) in total.
Energy Management Team Leader	A leader with authority, technical understanding, and motivating skills; directly reports to the management representative on EnMS matters. Should be partnered with a civilian who is not expected to transition away during the implementation.	1/2 to 1 FTE in addition to the team members' time.

5. Relationship of ISO 50001 with Other Marine Corps and DoD Initiatives

Executive and Marine Corps Orders

Marine Corps installations are subject to many energy-related executive and Marine Corps orders, as well as other mandates. Below are some examples of applicable mandates (USMC, 2013 and USMC, 2011).

- USMC Installations Energy Strategy
- MCO P11000.9D Marine Corps Energy and Utilities Management
- USMC Expeditionary Energy Strategy and Implementation Plan
- USMC EIP Project Documentation Instruction
- MCIEAST Energy and Water Strategy
- DODI 4170.11 Installation Energy Management
- Department of the Navy's Energy Program for Security and Independence

These mandates collectively establish several ambitious quantitative targets for energy conservation and renewable energy as below, which would be difficult to achieve if Marine Corps installations are restricted with a project-by-project approach. At the time this report was written, MCAS Beaufort has updated the baselines and targets used at the beginning of the EnMS implementation to be compliant with the new mandates. As stated in MCAS Beaufort's updated energy policy:

By FY 2020:

- Install advanced meters on facilities to accurately capture 85 percent of electrical and natural gas consumption
- Install water meters to identify system losses and individual facility use for all water-intensive facilities
- Reduce utility costs by 10 percent with respect to a 2013 baseline
- Reduce fossil fuel usage in vehicle fleets by 30 percent with respect to 2005 baseline

By FY 2025:

- Reduce facility energy intensity by 25 percent with respect to a 2015 baseline
- Reduce water intensity by 36 percent with respect to a 2007 baseline
- Renewable and alternative energy sources shall account for not less than 30 percent of total facility energy requirement

The updated energy objectives and targets present more stringent requirements on Marine Corps installations to conserve energy and increase the renewable energy portfolio. As shown in Figure 5 and Figure 6, in order to stay compliant with mandates, MCAS Beaufort will have to achieve continual improvement of its energy performance equal to that seen in the previous decade. This will have to be accomplished despite many large capital projects already being implemented. Beaufort's ISO 50001-conformant EnMS will allow it to direct its resources in a systematic way to achieve its goals with a focus on operational control and improvement.

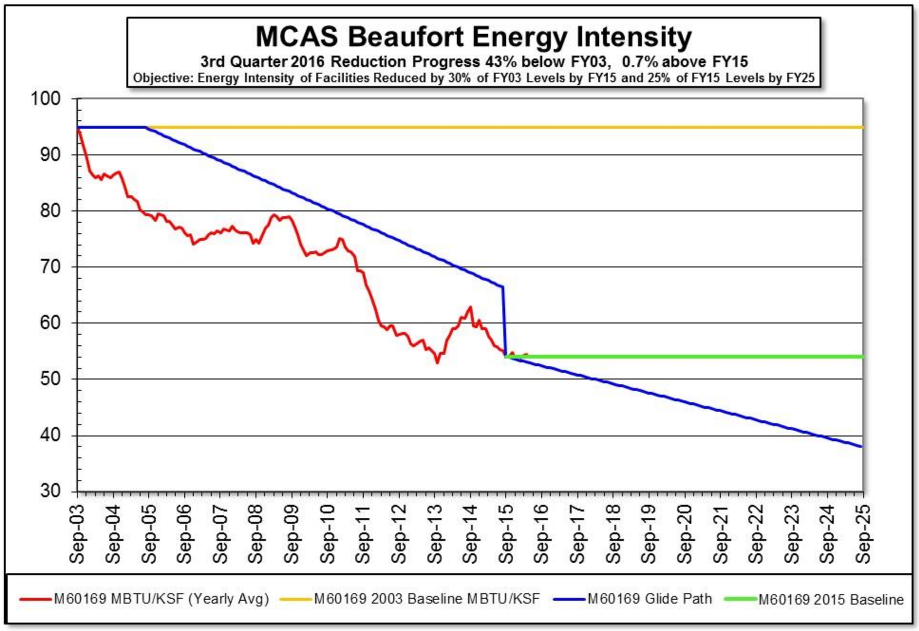

Figure 5. MCAS Beaufort Facility (SEUs Excluded) Energy Intensity Trend (red line) Compared to the Mandated Target (blue line) (baseline recently changed from FY2003 to FY2015)

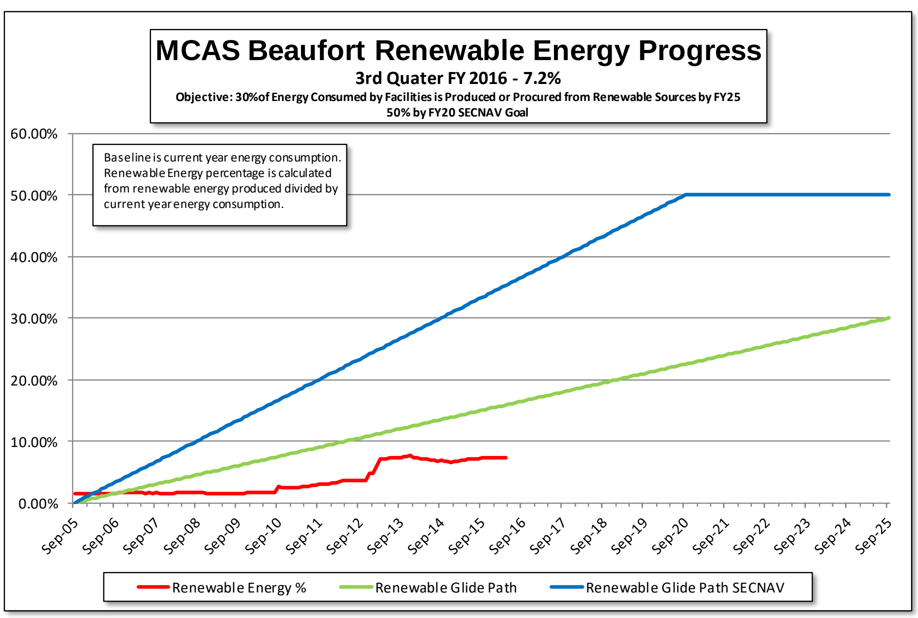

Figure 6. MCAS Beaufort Renewable Energy Percentage in Total Energy Consumption Trend (red line) Compared to Mandated Target (green line)

A systematic approach is necessary for tracking updates and new mandates in order for Marine Corps installations to stay compliant. ISO 50001 provides an excellent platform for establishing and maintaining the management system processes that are desirable for this purpose. Furthermore, the continual improvement framework of ISO 50001 enables a mechanism for prioritization, identification, planning, implementation, monitoring, and adjustments that is necessary to deliver on those ambitious targets. The structured approach for taking measurements and tracking performance promoted by ISO 50001 also make it much more manageable and accurate to perform the required reporting for those mandates.

Energy Ethos

Foreseeable future fiscal constraints requires that Marine Corps further reduce utilities purchase cost so as to alleviate constrained base operation support (BOS) budgets. Installation Commanders are to make every practical effort to reduce utility cost by 10 percent by 2020. Achievement of this goal will require moving beyond technical solutions; communication and education initiatives also are necessary to change users' attitudes and behaviors.

Energy Ethos is the shared vision that the efficient use of energy resources is a critical component of mission readiness. In the 2011 Expeditionary Energy Strategy, the Commandant directed the Marine Corps to be aware of and value our limited energy and water resources, whether operating aboard installations or on deployment. This "Bases to Battlefield" approach promotes the establishment of an energy ethos that equates efficient use of vital resources to enhanced mission readiness on installations and operational effectiveness in combat. Every Marine, civilian, and visitor bears responsibility for being a good steward of resources. An energy ethos that values responsible use of resources supports the efforts of Marine Corps installations to meet mandates, drive down costs, and mitigate risks associated with vulnerable supply chains. (USMC, 2013)

Led by the Marine Corps Installations Command (MCICOM), the Energy Ethos campaign is rolled out in the following three functional areas:

- Energy Information Management Dashboard
- Unit Energy Manager Program
- Energy Communications Engagement

As discussed earlier in the example with MCAS Beaufort, Energy Ethos and ISO 50001 build upon each other, and the implementation of an energy ethos can be part of an ISO 50001 EnMS. There are a couple reasons for this: ISO 50001 promotes a holistic approach for managing energy, which includes energy-user behavior, and it provides a platform for integrating multiple parallel or related efforts in an organization that address energy management. Without an EnMS, those efforts tend to be siloed and lack coordination, limiting the potential to achieve a successful outcome. Energy Ethos serves as the foundation of any effective energy management program, both in garrison and in theater, because energy-user awareness and behavior is elemental to the most effective energy management.

Unit Energy Manager

The Unit Energy Manager (UEM) program is a key strategy for establishing Energy Ethos within the Marine Corps. Through the UEM program, one Marine in each tenant unit on every installation will be appointed as the point of contact (POC) for energy issues to their unit leadership and fellow Marines. The UEM program will provide Operational Commanders with greater visibility of resources, and assist the Marine Corps in spreading a culture of conservation across installations. (USMC, 2016)

The UEM program will lay the foundation for the implementation and adoption of an Energy Ethos throughout the Marine Corps by promoting collaboration between installations and tenant units. Since installation commands own the physical infrastructure but are not the primary end-users of energy and water on the installation, it is crucial to educate and involve tenant and supported commands in fostering this ethos. Unit Energy Managers will act as energy champions, promoting smart energy behaviors while collaborating with energy professionals to identify efficiencies and gain valuable professional experience.

It is expected that there will be at least 200 UEMs across all Marine Corps installations. The UEM program provides them with trainings and regular meetings to ensure that they have the information and competencies needed to be effective. The trainings include a wide spectrum of overview sessions and technical deep-dives.

The UEM program can be deeply linked with ISO 50001 implementation within the Marine Corps because of its reach into the smallest operating units. The collaboration the UEM program intends to create between installations and tenant units is critical to breaking down barriers in the ownership and communications of energy issues. Without it, many energy conservation efforts tend to be abandoned or impeded due to poor organizational structure support. Our experience tells that only relying on one or a few energy champions to carry forward energy management programs at a large organization tends to limit the level of engagement with the rest of the organization. As a result, the few energy champion(s) tend to encounter more barriers in attempting to change behaviors and create impacts beyond installing energy efficiency technologies. The UEM program provides a Marine Corps reality-based solution to address this common barrier. In return, ISO 50001 provides the mechanism for standardization energy management processes and procedures, which will play an important role in making sure that the organization integrates best practices identified across the board and sustains these desirable practices despite frequent personnel rotations. The ISO 50001 continual improvement framework also drives the UEM program beyond a one-off effort and towards maturity in its model, training style and contents, participation, and ultimate results.

6. Conclusions

In this project, MCAS Beaufort took on a pioneering role in energy management among Marine Corps and other DoD installations by demonstrating the value and feasibility of implementing ISO 50001 Energy Management Systems at a military facility. By December 2015, with the assistance of the LBNL and Georgia Tech team, the Air Station implemented all the requirements of the ISO 50001 standard. The implemented ISO 50001 EnMS provides the management processes and organizational structure necessary to effectively address multiple energy-related objectives, including reducing energy demand and cost, mitigating environmental impact, and improving mission assurance through energy security.

The implementation at MCAS Beaufort demonstrates the unique value of integrating energy into an organization's management processes with an EnMS at military installations. The continual improvement principles installed as part of the ISO 50001 EnMS leads to more robust discovery and sustenance of energy performance improvements beyond those that can be achieved through project-by-project based energy performance improvement actions. The demonstrated benefits of implementing ISO 50001 at Marine Corps Air Station Beaufort included the following:

- Visible demonstration of social responsibility and alignment with DoD's strategy for mission readiness
- Sustained commitment from top management
- Standardized and disciplined energy management processes that persist better throughout personnel rotations
- Continual energy and cost savings meeting and surpassing mandates
- Improved, data-informed operational and capital decision-making
- Increased awareness and transparent communication on energy management and performance across all organizational levels

Through a 28-month demonstration project, MCAS Beaufort established a feasible model of integrating an ISO 50001 EnMS into existing Air Station processes and operations. Leveraging external experts to conduct the gap and energy assessments and phase-based implementation training, and to provide technical assistance, was effective. Members of the Air Station's energy team worked closely with the experts and brought forward many creative solutions to address the challenges of implementing an EnMS in a military community setting. This demonstration project has paved the way for EnMS implementations at other Marine Corps installations. Many of the strategies (found in the " ISO 50001 Implementation Strategies at MCAS Beaufort" section), essential success factors learned (see Appendix A), and work products, such as document templates and example processes, are adaptable for other Marine Corps and military settings.

High energy intensity, aggressive mandates from multiple sources, complex organizational and command structures, and constant personnel rotation make ISO 50001 a unique proposition for the Marine Corps in support of DoD's overall strategy. The recently launched Energy Ethos and UEM program also make it an ideal time to implement ISO 50001 as an overarching governance for Marine Corps installations' energy programs.

ISO 50001 can provide the management system structure and processes needed to fully implement and sustain Energy Ethos and the UEM program for the long term. With the EnMS to support them, Energy Ethos and the UEM program hold considerable potential for successfully driving and sustaining energy consciousness across a Marine Corps installation, even to the level of the individual Marine. These programs are critical to achieving energy behavior change, an integral element of any comprehensive approach to energy management and energy performance improvement. Since ISO 50001 sets forth an EnMS structure that addresses an organization's facilities, equipment, systems, processes *and personnel*, it provides the foundation that can position Energy Ethos and the UEM program for success (see Appendix B).

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Appendix A: Key Success Factors for Future ISO 50001 Implementation among Marine Corps

MCAS Beaufort has led the way and demonstrated the value of implementing an ISO 50001 EnMS within the Marine Corps. Through the efforts undertaken at MCAS Beaufort, the Marine Corps and other DoD installations can learn how to organize and effectively implement ISO 50001. In addition to the recommendations in the "Leadership Structure and Resources" section, there are three other key elements of a successful implementation strategy. These include: (1) communication and engagement, (2) understanding the context of the organization, and (3) monitoring and evaluation. These suggestions are based upon the successes and challenges observed at MCAS Beaufort and other ISO 50001 EnMS implementations.

Communication and Engagement

Early and ongoing communication is a critical element needed to support the culture change inherent in EnMS implementation. The Marine Corps is mission-driven, and EnMS implementation will have to compete for attention with other messaging in place. Including communication planning as part of ISO 50001 implementation project management should help an installation:

- Obtain buy-in from top management and sustain it;
- Identify key stakeholders and the types of messaging most likely to attract their attention;
- Elevate the project (EnMS implementation) as a priority;
- Develop a common understanding of the need for and benefits of the EnMS;
- Engage personnel through mechanisms that promote dialogue, buy-in, and participation;
- Ensure the consistency, transparency, and timeliness of information provided to the workforce (military and civilian) and their management;
- Increase energy awareness and encourage the identification of new opportunities for improved energy performance;
- Kick off implementation of the communication requirements of ISO 50001, particularly those related to the responsibilities of senior leadership.

Understanding the Context of the Installation

Understanding the context of the installation is an important step in managing change and ISO 50001 implementation. It can help guide strategic approaches to the change process. A gap assessment conducted to determine the current state of practices related to an ISO 50001 EnMS will help identify some of the organizational priorities, structures, processes, and issues that can or will influence or otherwise affect the installation's ability to implement an ISO 50001 EnMS. The following elements of the context (or "realities") must be taken into account when planning for the ISO 50001 implementation:

- **Mission readiness:** Being mission ready is job one. Energy considerations compete for attention and resources with other priorities and needs.
- **Energy mandates:** The Marine Corps is responsible for an ever-increasing number of mandates (e.g., Executive Orders) related to energy. This is the key driver for both energy savings projects and accountability for energy performance. It also has implications for EnMS processes related to legal and other requirements, energy objectives and targets, operational controls, and monitoring and measurement.
- **Multiple hierarchical structures:** Consistent with the military context, the organizational and budgeting structures of Marine Corps installations are hierarchical and command-and-control based. This can present challenges for resource allocations related to personnel whose participation on the implementation team will be needed, such as operations units. Multiple hierarchical structures also can affect the timelines involved in required actions by senior leadership. Energy projects must essentially follow the project proposal and approval processes that are part of established budget cycles. To accomplish the cultural change involved in implementing an EnMS, there must be full buy-in across multiple levels of stakeholders who do not report necessarily to the same chain of command.
- **Informal processes:** The Energy Manager position is a key resource for expanding energy communications and awareness, energy improvement actions, and energy management accountability across the installation. Some of the existing processes for internal communication about energy and for identifying energy performance improvement opportunities are informal, relying on the personal relationships of the Energy Manager. Taking steps to formalize such informal processes can take time.
- **Existing management systems:** Well-established environmental management systems offer significant opportunities for leveraging existing management system processes for the ISO 50001 EnMS, including processes for competency and training, communication, document and record control, internal audits, corrective and preventive action, and management review.
- **Personnel rotation**: Military personnel are subject to assignment rotation. This can present challenges for the implementation effort and for sustaining top management commitment to the EnMS. Engagement of civilian staff and educating newly rotated personnel about EnMS implementation and function is critical.

Under certain conditions, any of the above elements of the context could pose implementation barriers. Managing or, as appropriate, resolving them effectively will remove potential risks to the success of the EnMS implementation.

Monitoring and Evaluation

To help keep the EnMS implementation on track, the implementation team will need the support of subject matter experts and senior leadership. To facilitate this support and to identify implementation roadblocks, the implementation plan should include regular monitoring and evaluation. This helps to track progress, maintain focus on the project, and demonstrate success. The following activities are recommended to facilitate successful project management:

- **Implementation Team Meetings:** The implementation team needs to be supported with regular team meetings and work sessions. Otherwise, EnMS implementation can slow considerably and even falter. With multiple competing priorities, it can be difficult for individual team members to allocate all the time needed to accomplish their assigned implementation tasks. Team meetings help with this. They serve to set aside and allocate personnel time to work on the EnMS implementation. The team will need to coordinate the schedule and frequency of the meetings, giving consideration to the specific EnMS requirements currently being implemented, as well as any issues threatening the implementation progress. The agenda for these meetings should be structured but flexible to meet the needs of the team and the current status of the implementation. At times the agenda may need to be instructional, or a working session, or resource coordination, or some combination of these or other topics as dictated by the team's current needs.

- **Management Updates:** Regular updates should be provided to the Steering Committee. The content and frequency of the updates should reflect the state of the implementation and suit the needs of senior leadership. The update should provide leadership with an understanding of the resource needs of the implementation. Senior leadership is responsible for ensuring that adequate resources are provided to support the implementation.

- **Phase-based Internal Audits and Management Reviews:** An evidence-based approach to change management can help ensure that the goals of EnMS implementation are met and sustained over time. After each of the three implementation phases (Plan/Do/Check and Act), an internal audit should be scheduled and conducted to evaluate the EnMS processes that were developed and implemented during that phase. The internal audits evaluate the objective evidence of the implementation, and the results are used by the team to make any needed corrections or other adjustments. Conducting internal audits and management reviews in each phase of EnMS implementation also can serve to bolster and broaden personnel awareness of the EnMS. Internal audit results are reported to top management in a subsequent management review. This helps senior leadership stay up to date on the implementation progress, familiarizes them with details of the EnMS, and provides them with information to support informed decision-making about energy management and energy performance improvement.

Appendix B: ISO 50001 Provides the Processes Needed to Deploy "Energy Ethos" and Support Utility Demand Reduction

Utility Demand Reduction / Energy Ethos Requirement	**ISO 50001**	**ISO 50001 Energy Management System Processes (Relevant Section Number in Parenthesis)**
Maintain efficient operation of new and renovated facilities	✔	• Define competencies for personnel working with significant energy uses (SEUs) (4.5.2) • Identify and plan operational and maintenance controls for SEUs and energy objectives and targets (4.5.5) • Establish criteria for effective operation and maintenance (4.5.5) • Operate and maintain facilities, equipment, systems, and processes to meet operational criteria (4.5.5) • Ensure monitoring, measurement, and analysis of operations that determine energy performance (4.6.1) • Consider energy performance improvement opportunities and operational control in design of new, modified, and renovated facilities, equipment, systems, and processes (4.5.6) • Set criteria for assessing lifetime energy performance in procurement actions for items having significant impact on energy performance (4.5.7)
Energy Ethos Campaign / Unit Energy Manager Program	✔	• Scope of an ISO 50001 energy management system includes facilities, equipment, systems, processes, and personnel • Senior leadership to communicate importance of energy management (4.2.1) • Appoint management representative to report on energy performance and provide recommendations for improvement (4.2.2; 4.7) • Energy team authorized to support energy management activities (4.2.2) • Management representative and team to promote awareness of energy policy and energy objectives (4.2.2) • Identify energy management training needs (4.5.2) • Communicate internally about energy performance (4.5.3) • Set up suggestion/comment system for personnel and contractors (4.5.3) • Ensure personnel and contractors are aware of their energy impacts and their energy responsibilities (4.5.4)
Energy Information Management Dashboard	✔	• Analyze past and present energy use and consumption based on measurement and other data (4.3.3) • Ongoing internal communication about energy performance (4.5.3) • Ensure monitoring, measurement, and analysis of operations that determine energy performance (4.6.1)
Utilities Contract Renegotiations	✔	• Define specifications for energy supply (4.5.7)

<table>
<tr><th>Utility Demand Reduction / Energy Ethos Requirement</th><th>ISO 50001</th><th>ISO 50001 Energy Management System Processes (Relevant Section Number in Parenthesis)</th></tr>
<tr><td>Industrial Control Systems</td><td>✔</td><td>• Identify and prioritize energy performance improvement opportunities (4.4.3)
• Identify and plan operational and maintenance controls for SEUs and energy objectives and targets (4.5.5)
• Establish criteria for effective operation and maintenance (4.5.5)
• Operate and maintain facilities, equipment, systems and processes to meet operational criteria (4.5.5)
• Ensure monitoring, measurement, and analysis of operations that determine energy performance (4.6.1)</td></tr>
<tr><td>Consolidation of Excess Facilities</td><td>✔</td><td rowspan="2">• Senior leadership to provide resources needed to improve energy performance (4.2.1)
• Identify and prioritize energy performance improvement opportunities (4.4.3)
• Establish and implement action plans for energy projects (4.4.6)</td></tr>
<tr><td>Competitive Projects for EIP</td><td>✔</td></tr>
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